
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: RAMBALDI et al.

Atty Dkt No.: SGSTP009D1/97-B-068D1

Application No.: 10/613,830

Examiner: Hannett, J.

Filed: July 3, 2003

Group: 2622

Title: PIXEL CORRECTION SYSTEM AND
METHOD FOR CMOS IMAGERS

Confirmation No: 6799

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RESPONSE TO FINAL OFFICE ACTION

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Please consider the following amendments and remarks filed in response to the final Office Action mailed on September 17, 2008.

Amendments to the Claims are reflected in the listing of claims which being on page 2 of this paper.

Remarks begin on page 6 of this paper.

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-16. (Canceled)

17. (Currently Amended) A method of testing a pixel to determine whether it is faulty, the method comprising:

- (i) electronically resetting a selected pixel to a defined charge;
- (ii) delay reading the selected pixel for a defined length of time that corresponds approximately to the exposure time of the pixel while in use;
- (iii) reading the selected pixel's output; and
- (iv) comparing the selected pixel's output to an expected value wherein the expected value is modified by the defined charge provided to the selected pixel~~that is based upon the defined charge provided to the selected pixel~~, whereby if the selected pixel's output deviates from said expected value, designating the selected pixel as partially or completely corrupted.

18. (Original) The method of claim 17, wherein if the selected pixel is partially corrupted pixel, it is to be imaged by a first technique during readout and if the selected pixel is completely corrupted, it is to be imaged by a second technique during readout.

19. (Original) The method of claim 18, wherein determining whether the selected pixel is partially or completely corrupted comprises determining how far the selected pixel's output deviates from the expected value, such that if the selected pixel's output deviates by more than a defined amount from the expected value deeming the selected pixel to be completely corrupted and if the selected pixel's output deviates by no more than a defined amount from the expected value deeming the selected pixel to be partially corrupted.

20. (Original) The method of claim 18, wherein the first correction technique comprises adjusting the output of the selected pixel and wherein the second correction technique comprises replacing the output of the selected pixel with an average of the outputs of pixels located about the selected pixel.

21. (Previously presented) The method of claim 17, further comprising:
selecting a pixel to test.

22. (Previously presented) The method of claim 17, wherein the electronically resetting comprises:

- switching on a transistor associated with the selected pixel;
- discharging a photodiode associated with the selected pixel; and,

switching off the transistor associated with the selected pixel.

23-37. (Canceled)

38. (Previously presented) A method for characterizing a pixel, comprising:

setting a pixel voltage to a reset voltage, wherein the reset voltage corresponds to the state of the pixel when the pixel has been exposed to substantially no radiation, the setting operation comprising switching on a transistor associated with the selected pixel, discharging a photodiode associated with the selected pixel, and switching off the transistor associated with the selected pixel;

measuring the output voltage of the pixel;

determining if the pixel is partially corrupted or completely corrupted, wherein the determination of partial or complete corruption is based at least partially on the amount of deviation between the output voltage and the defined voltage;

determining if the pixel is partially saturated or completely saturated; and,

applying a type of pixel correction mechanism.

39. (Original) The method of claim 38, wherein the type of pixel correction mechanism applied is based on whether the pixel is partially or completely corrupted.

40. (Canceled)

41. (Previously presented) The method of claim 38, wherein the type of pixel correction mechanism applied is based on whether the pixel is partially or completely saturated.

42. (Original) The method of claim 41, wherein determining if the pixel is partially saturated or completely saturated only occurs if the pixel is determined to be partially corrupted.

43. (Previously presented) The method of claim 42, wherein if the pixel is partially corrupted and not saturated, it is to be imaged by a first technique during readout and if the selected pixel is completely corrupted or both partially corrupted and saturated, it is to be imaged by a second technique during readout, wherein the first and second techniques are different.

44. (Original) The method of claim 43, wherein the second technique is masking.

45. (Original) The method of claim 44, wherein the first technique comprises adjusting the output of the pixel by a fixed percentage.

46. (Original) The method of claim 43, further comprising storing the location and the characterization of the pixel.

47. (Currently Amended) An apparatus for characterizing a pixel, comprising:

means for setting a pixel voltage to a reset voltage, wherein the reset voltage corresponds to the state of the pixel when the pixel has been exposed to substantially no radiation;

means for charging the pixel with a defined ~~voltage~~ charge;

means for measuring the output voltage of the pixel charged with the defined ~~voltage~~charge;

means for waiting a defined length of time that corresponds approximately to the exposure time of the pixel while in use between charging the pixel and measuring the output voltage; and,

means for determining if the pixel is partially corrupted or completely corrupted, wherein the determination of partial or complete corruption is based at least partially on the amount of deviation between the output voltage and ~~the defined voltage~~ an expected value that is modified by the defined charge.

48-50. (Canceled)

51. (Currently Amended) A method of testing a pixel comprising:

- (i) selecting a pixel to test;
- (ii) switching on a transistor associated with the selected pixel;
- (iii) discharging a photodiode associated with the selected pixel;
- (iv) switching off the transistor associated with the selected pixel;
- (v) waiting for a for a defined length of time that corresponds approximately to the exposure time of the pixel while in use;
- (vi) reading the selected pixel's output;
- (vii) comparing the selected pixel's output to an expected value ~~that is based upon the defined charge provided to the selected pixel~~ wherein the expected value is modified by the defined charge provided to the selected pixel; and,
- (viii) determining if the pixel is partially corrupted or completely corrupted.

52. (Previously presented) The method of claim 51, wherein discharging the photodiode resets the photodiode to a reset voltage corresponding to a voltage associated with no radiation being sensed by the pixel.

53. (Previously presented) An apparatus for characterizing and correcting a pixel, the apparatus comprising:

a pixel array including a plurality of uncorrupted pixels, completely corrupted pixels, and partially corrupted pixels, each pixel comprising a photodiode for measuring a radiation intensity and a transistor;

an analog-to-digital converter for converting an analog pixel output to a digital output signal;

a fault analysis and correction block configured to pass through the digital output of an uncorrupted pixel, mask the digital output of a corrupted pixel, and mask or adjust the digital output of a partially corrupted pixel based on whether the output is saturated; and,

a memory for storing fault and correction data.

54. (New) The apparatus of claim 53, further comprises a voltage test mechanism comprising a defined illumination source and a delay timer.

55. (New) The apparatus of claim 53, wherein the fault and correction data includes the location of the pixel, type of corruption, and correction information.

REMARKS

Claims 17-22, 38, 39, 41-47, and 51-56 are pending. Claims 48 and 49 are canceled. Claims 54 and 55 are new.

Claims 17, 47, and 51 are amended per Examiner suggestion (Final Office Action, page 2, second paragraph) to overcome the current grounds of rejection.

Claim 47 has also be amended to recite “defined charge” to be consistent.

Support for new claim 54 may be found at least at page 10, lines 25 to 27.

Support for new claim 55 may be found at least at page 12, line 6-10 and page 16, line 17-22.

Applicants gratefully acknowledge the indication of allowability for claims 38, 39, 41-46, and 53. Applicants added new claims 54 and 55. These new claims are believed also allowable because they depend from allowable claim 53.

ART REJECTIONS

Claims 17 and 51

Claims 17-21, 47 and 48 were rejected under 35 U.S.C. 102(b) as being anticipated by Sweetser. Claims 22, 49, 51, and 52 were rejected under 35 U.S.C. 103(a) as being unpatentable. Regarding claims 17 and 51, the Examiner in the Office Action suggested a claim amendment to overcome the current grounds of rejection. Applicants have amended these claims as suggested by the Examiner. Claims 17, 51, and their dependent claims are believed allowable. Withdrawal of these rejections is respectfully requested.

Claim 47

The Examiner disagreed with the applicants as to claim 47. The Examiner asserts that the claim is “written broadly and does not define the specifics of “a defined voltage” and merely claims “a defined voltage”. (Office Action, page 3, last paragraph) The recitation of “defined voltage” has been replaced by “defined charge” for consistency.

Additionally, applicants have amended claim 47 in the same manner as suggested by the Examiner for claims 17 and 51. As amended, claim 47 recites “means for determining if the pixel is partially corrupted or completely corrupted, wherein the determination of partial or

complete corruption is based at least partially on the amount of deviation between the output voltage and an expected value that is modified by the defined charge.” Applicants believe that this amendment puts the claim in condition for allowance for the same reasons claims 1 and 17 are allowable.

CONCLUSION

In light of the above remarks, the rejections to the independent claims are believed overcome for at least the reasons noted above. Applicants believe that all pending claims are allowable in their present form. Please feel free to contact the undersigned at the number provided below if there are any questions, concerns, or remaining issues.

Respectfully submitted,
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